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ABSTRACT

Designed to interpret comprehension recalls in terms of textual information and cognitive processes used, this instrument outlines four stages for interpretive recalls, based on the premise that recall of a text results from receptive and productive processes. Stage 1 specifies which information is pertinent for analysis; stage 2 discusses the implications of which linguistic unit to use in categorizing the data; stage 3 outlines the comprehension categories; and stage 4 discusses the implications of weighting the responses assigned to categories. (This document is one of those reviewed in The Research Instruments Project (TRIP) monograph "Measures for Research and Evaluation in the English Language Arts, Volume 2," published by the Committee on Research of the National Council of Teachers of English in cooperation with the ERIC Clearinghouse on Reading and Communication Skills. The TRIP review, included here as an introduction to the instrument, describes the instrument's category (reading), title, author, date, age range (primary to postsecondary), purpose, and physical characteristics.) (JL)

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Comprehension Categories for Protocol Analysis.

The measurement instruments contained in this document have been reviewed in a monograph (cited below) edited by William T. Fagan, Charles Cooper, and Julie Jensen, for The Research Instruments Project (TRIP), and funded by a grant from the Trustees of the NCTE Research Foundation:

Measures for Research and Evaluation
in the
English Language Arts
Volume II

The purpose of the editors has been to select and review measurement instruments pertaining to all aspects of research and evaluation in the English language arts, e.g. language and language development, literacy, literature, reading (including comprehension, teacher-pupil interaction, etc.), writing, and teacher knowledge and attitudes. In order to make some of the actual instruments reviewed more readily available, the ERIC Clearinghouse on Reading and Communication Skills (ERIC/RCS) has cooperated with the editors by processing selected instruments into the ERIC system (see the 42 documents assigned Clearinghouse accession numbers CS 207 904-945).

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Category: Reading

Title: Comprehension Categories for Protocol Analysis

Author: William T. Fagan

Age Range: Primary to post secondary

Description of the Instrument:

Purpose: To interpret comprehension recalls in terms of textual information and cognitive processes used.

Date of Construction: 1981

Physical Description: Whereas a recall is a "product" of having read a text, it also results from two sets of processes: receptive and productive. The instrument outlines four stages for interpretive recalls. Stage 1 specifies which information is pertinent for analysis; stage 2 discusses the implications of which linguistic unit to use in categorizing the data. The comprehension categories are outlined in stage 3; while stage 4 discusses the implications of weighting of the responses assigned to categories.

The procedures may be used with any recall. The first category and the criteria for assigning responses to this category are given below:

A. Text Exact

This category includes information from the text in its exact form or with minimal variations. It is assumed that this information was stored in rote fashion or is automatically constrained by other information and is "reproduced" in a similar state.

A1. Verbatim Recall

The information is a direct recall of the lexical items of the text.

Text: The boys were late for school.

Protocol: The boys were late for school.

Substitution of a determiner, a verb form or a function word which does not change the meaning of the unit will also be placed in this category.

Text: He chased the animal.

Protocol: He chased an animal.

Text: People were waiting at the door.

Protocol: People were waiting by the door.

Text: The student had been absent many times.

Protocol: The student was absent many times.

A2. Partial Recall

A significant concept(s) (noun, verb, attribute) is/are omitted in the verbatim recall.

Text: After robbing the store, the convicts raced for their car.

Protocol: The convicts raced for their car.

Text: The children had never seen such a tiny colt.

Protocol: The children had never seen such a colt.

This category would also include fragmented units which are not mazes and although not semantically complete do indicate that the reader has noted and attempted to retrieve concepts which continue the story line.

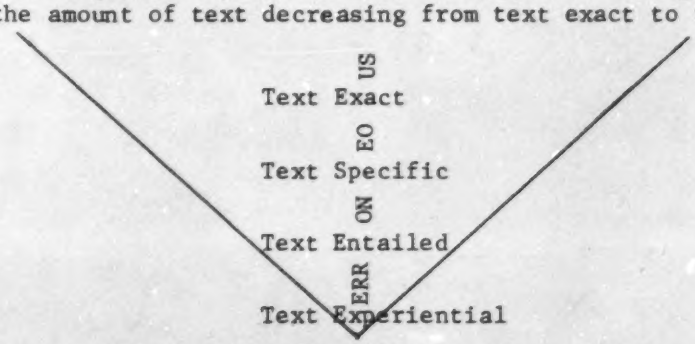
Text: The stranger told him to follow his advice and put his lines at the spot indicated.

Protocol: The stranger told him...that he would put...all his lines...

Validity, Reliability and Normative Data:

The comprehension categories have been based on the construct of reading comprehension (as measured by a recall) as involving the reception and production of information which is generated from an interaction of the text data and the reader's prior knowledge. As indicated in the description of the categories, certain assumptions about the underlying processes that may contribute to that category are made based on the work of Kintsch and VanDijk (1978).

The categories may be sequenced in terms of the proportion of text data and prior knowledge that may have contributed to the recall. This sequence may be illustrated by the following diagram with the amount of text decreasing from text exact to text experiential.



Interrater reliability based on assigning 187 clause units to categories produced the following percentages of agreement.

Category		
	A	98.5
	B	97
	C	93
	D	96
	E	95

Related Documents:

Fagan, William T. Comprehension categories for protocol analysis. Unpublished paper. The University of Alberta, Edmonton, 1981.

Kintsch, Walter, and VanDijk, Teun A. Toward a model of text comprehension and production. Psychological Review. Vol. 85, No. 5, 363-394, 1978. (EJ 191 792)

Comprehension Categories

The following categories are based largely on the work of Drum and Lantaff (1977), earlier work by the author (Fagan, 1978, 1980) and on two research studies that tested the earlier category system (Brake, 1981; Beebe, Fagan and Malicky, 1981). Their purpose is to provide a structure to assess the degree of comprehension as indicated by a recall protocol. This may be achieved in four stages.

Stage 1: Eliminating Irrelevant Data

The first step is to isolate that information which will be analysed. In order to do this it is necessary to eliminate two categories of data: mazes and recall conventions.

1. Mazes may be either of four types.

Filled Pause (Audible Noise): This consists of sounds which may be represented as ah, er, um, etc.

Filled Pause (Interjection): This consists of words or phrases which seem to mark time for the speaker before going on to the next thought. Examples are well, I think, yes, let me see, wait a minute, etc.

Filled Pause (Repeat): This includes the repetition of words or parts of words.

He saw a golf - a golf cart.

The little girl was per - perturbed.

The words or word part spoken initially are classed as the Repetition since it is assumed that once the speaker repeats, he ends the pause and continues to complete the utterance.

Correction/Edit: This consists of a jumble of words preceding a change in direction of what the person was about to say, or preceding a better choice of words.

He wanted to sell - to buy the golfballs.

The boy collected golfballs in the - around where - where he - on the golf course near where he was lived.

There will be only one instance of a type of hesitation pause/correction edit within a sequence. For example, if a word is repeated six times, it is one instance of a Filled Pause (Repeat); if several words are used before the child gets back in the right track, this is one instance of a Correction/Edit.

2. Recall conventions are concerned more with the narrating than with the actual content of the text. They may express a reader's limitations in not being able to remember or may include vague generalizations which appear to be a cover-up for lack of specific knowledge. Following are examples of recall conventions.

Text: (no specific referents)

Protocol: "Well it says that..."
"And in the second paragraph the story says..."
"That's all I can remember."

Protocol: "That was a good story"
"I found it hard to remember the part where all the characters were introduced."

Also included are phrases used by the reader to insert an event in proper sequence due to forgetting while recalling.

Protocol: Before that he set out his hooks for fishing. (The "before that" acts as an addendum to insert information in its proper sequence after subsequent information had been recalled. A synonymous statement to "before that" would be "I forgot that".

Text: (detailing the advantages of heat)

Protocol: Heat helps lots.

Text: (describing the manufacture of various items of clothing)

Protocol: They make dresses and stuff like that.

Stage 2: Choosing a Unit for Analysis

Different units may be chosen for analysis - proposition (Kintsch, 1974), syntactic proposition (Fagan, 1978), clause or t-unit (Hunt, 1965). An assumption made when choosing a unit is that this represents a meaningful division of information and that the reader may perceive this unit when comprehending and/or recalling information. Since it cannot be determined with definitiveness which unit operates in this manner (in fact it is likely that different units may be processed at different times), the unit chosen for analysis will have different implications when interpreting the results obtained. For example, if the smallest unit is chosen - the syntactic proposition - then it is easier to determine if this fits into a category since verbatimness, synonymy etc. is easier to analyse within this smaller unit than within a larger unit such as the t-unit. Consequently the interpretation of results would be weighted in terms of this category. If, on the other hand, the t-unit is chosen, then it is easier to judge if a summary has taken place since it is difficult to provide a summary of information within the brevity of the syntactic proposition. The clause unit is intermediate in length between the syntactic proposition and the t-unit/incomplete t-unit, and whereas it may not have the full advantages of either of these, it also does not have their full disadvantages.

In order to isolate clauses, it is suggested that the protocol first be divided into t-units and incomplete t-units (Fagan, 1978) which are defined as follows:

T-unit: This is a single independent prediction (main clause) together with any subordinate clauses that may be grammatically related to it. It may be a single or a complex sentence, but not a compound sentence.

In dividing a passage into t-units, one approach is to consider you are editing the transcript and are directed to rewrite as sentences according to the definition above. Where there is a compound sentence, divide before the connecting conjunction (and, but, etc.) and begin the next sentence with the conjunction. Do not change any words, but bracket these words which do not fit into the regular flow of language that make up the t-units(ie., mazes).

Further guidelines for segmenting t-units are:

1. When a quote consists of more than one principal clause, only the first one is included with the words that identify the speaker.

   e.g. /Christopher said uncle when shall we get there/it's such a long walk/

2. Having a t-unit within a t-unit is possible.

   e.g. /and he (/now he was scared/) told the captain . . .

3. When the meaning of a passage indicates that a subordinate conjunction has been omitted, the clause involved does not form a new t-unit.

   e.g. /he decided that he should go cause there was nobody around and (cause) there was stuff . . .?

4. "Yes" is included in the succeeding t-unit if the following statement is an elaboration of the answer; otherwise, it is considered to be an incomplete t-unit.

   e.g. /yes I guess you missed . . ./

   /yes/ what do you want it for/

5. Intonation may determine the location of the boundary when a phrase, structurally, can be attached to either the preceding or subsequent t-unit.

   e.g. "I think" as in:

   /he went I think/ he said he planned to any way/

6. Expressions like "I think," "I believe" are considered part of the t-unit if they are integral to the statement as for example:

   /I think he went said John/

   If the expression appears to be idiosyntactic to the speaker, the words are considered a "holder" type maze and are not counted as part of the t-unit.

   e.g. /Floods cause much damage/ (I think)

Incomplete t-unit: This consists of a group of words which do not form a complete independent clause but which are necessary to the ongoing flow of language. Since it does not form a complete independent clause, it is different from a t-unit. It may be lacking a subject, a verb, object, or complement, or any combination of these.

The incomplete appears to serve either of four functions: specifying particular information; elaboration of an antecedent; making additional comments on a topic; or establishing a referent for an ambiguous item.

He pushed one guy down in the water, pushed him on the ground, started punching him.

So he got fed up with this kind of deal, everyone chasing him.

And so the man is looking, couldn't find him.

He'd sell it to them, the balls.

An analyses of a transcription is given below.

He asks them for four golf balls//or he's gonna put his boots into the river//(and, and) (um) (he gave them) //the boy gave them four (four) (um) golf balls//they drop his boots anyway/because they are mean//he goes back looking for them//goes home (because after) (um)// he had a dream// . . .

T-units //	6
Incomplete t-unit ———	1
Filled Pause (Audible noise)	3

Filled Pause (Repeat)	2
Correction/Edit	2
Clauses ../ and .//	7

Stage 3: Comprehension Categories

A. Text Exact

This category includes information from the text in its exact form or with minimal variations. It is assumed that this information was stored in rote fashion or is automatically constrained by other information and is "reproduced" in a similar state.

A1. Verbatim Recall

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Text: The boys were late for school.

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Substitution of a determiner, a verb form or a function word which does not change the meaning of the unit will also be placed in this category.

Text: He chased the animal

Protocol: He chased an animal.

Text: People were waiting at the door.

Protocol: People were waiting by the door.

Text: The student had been absent many times.

Protocol: The student was absent many times.

A2. Partial Recall

A significant concept(s) (noun, verb, attribute) is/are omitted in the verbatim recall.

Text: After robbing the store, the convicts raced for their car.

Protocol: The convicts raced for their car.

Text: The children had never seen such a tiny colt.

Protocol: The children had never seen such a colt.

This category would also include fragmented units which are not mazes and although not semantically complete do indicate that the reader has noted and attempted to retrieve concepts which continue the story line.

Text: The stranger told him to follow his advice and put his lines at the spot indicated.

Protocol: The stranger told him...that he would put...all his lines...

B. Text Specific

In this category is placed information recalled that has specific references in the text. The reader may have "transformed" some of this information by reordering or substituting lexical items.

B1. Substitution of Pronouns

A pronoun is used in place of a noun when the noun referent is present elsewhere within the text. All other items in the unit are verbatim.

Text: People were very kind to the stranger.

Protocol: They were very kind to the stranger.

Text: The truck went off the road about one half mile from the settlement.

Protocol: It went off the road about one half mile from the settlement.

B2. Synonymy of Elements

The operational definition of synonymy is context dependent and may refer to (a) substitution of one word for another so that semantic and grammatical features are preserved, (b) the sequencing of lexical items from a unit such as the preposing of prepositional phrases or substituting an active for a passive, and (c) a paraphrase of the original unit which in the subjective opinion of the scorer has the same conceptual referents and has definite correlates in the text unit.

Text: fish

Protocol: salmon

Text: The house was on fire.

Protocol: The house was burning.

Text: In twos and very slowly the mourners walked in procession.

Protocol: The mourners walked in procession very slowly and in twos.

Text: He said good night and went to bed.

Protocol: He decided to call it an evening and said good night.

C. Text Entailed

The information retrieved is (a) a paraphrase of or synonymous with the information input, but the unit of recall includes information from more than one unit of input, or (b) a superordinate statement subsuming information from more than one text unit. It may be assumed that at the time of comprehending the reader "constructed" information and may still "transform" it at the point of recall.

C1. Synthesis

A synthesis statement is (i) a compilation of at least two units of information. It may not contain either of the specific units summarized but may be expressed in a hierarchial or superordinate category or by a label generalizing the events summarized, such as a main idea, theme, or moral.

Text: He quickly raced to the landing, stripped off his clothes and jumped into the icy water to rescue the frightened little boy.

Protocol: He did a very brave deed.

Text: While visiting her Aunt Lizzie at the farm last weekend, Teri helped harvest some carrots, peas, zucchini and tomatoes.

Protocol: Last weekend, Teri helped her Aunt harvest some vegetables.

C2. Summary

A statement is a summary if it relates information from at least two units in the text in an embedded form, that is some of the lexical items or units of information are deleted during this process. In summarizing the exact words or their synonyms may be used.

Text: She jumped into the icy water. She was trying to save the swimmer who was in trouble.

Protocol: She jumped into the icy water to save swimmer in trouble.

Text: The stranger pitied the man. He had tried to help but had not been very successful. The stranger felt deep remorse but knew that the man would have to settle his own problems without outside interference. The stranger stared quietly as the man walked slowly away.

Protocol: The stranger pitied the man who walked slowly away.

D. Text Experiential

This information is added by the reader to fill in gaps in the text data. The reader is "reconstructing" information based on prior knowledge which may be of world events such as rodeo, or from having read or listened to other texts.

D1. Inference

An inference may include either a logical reasoning or an instantiation, that is, the filling in of information suggested by the text information but not specified. The latter is often referred to as a pragmatic inference and may be stated in a contradictory form and still make a plausible statement.

Text: John and Bill left for school at the same time and walked at the same rate. But Bill lived several blocks farther away from the school than John. John just reached the school on time. He hoped that Bill would still be able to play ball that evening.

Protocol: (Logical): Bill was late for school.

Text: The mother bundled the children in their parkas, scarves and mittens. She was sure they all had a hot lunch as they left for school.

Protocol: (Pragmatic): It was a cold day.
(Contradiction: It was not a cold day. Perhaps the mother was mentally deranged).

D2. Case Related Information

This includes the expansion of permissible sequences that are assumed extensions of a unit of information in the text. This subcategory describes appropriate prior knowledge of similar content.

Text: Ground corn

Protocol: Ground corn with a rock.

Text: The captain climbed the mast of the distressed ship and signalled for help.

Protocol: The captain climbed the mast of the distressed ship and signalled for help with his flag.

Text: Used for etching.

Protocol: Used for the etching of drawings.

D3. Experiential Intrusions

This information is related to the theme of the text passage but is not specifically suggested by a particular unit in the text. It does not convey the text information but is an addition of information from the reader's background.

Text: The little boy had disobeyed his mother. She had told him to wait by the car while she went back to the store for the other bag of groceries. Now she could not find him anywhere.

Protocol: One time I saw this woman looking everywhere for her little boy. He went up the escalator when she wasn't looking.

D4. Storyline additions

These units include additions to the information within the storyline. The origin of these additions appears to be based on the reader's experience with stories and the kinds of goals or actions which are appropriate in a particular context and thus are predictable from the story information. Also included are expressions that indicate saying, thinking, etc. which are not specifically stated in the text. These are not inferences since they are not immediately constrained by a specific part of the text.

Text: (describing a characters actions that let up to making a decision).

Protocol: He thought he would catch the next train and finally settle the matter completely.

Text: The stranger saw that the man was weak and finally dug a hole through the ice for him.

Protocol: The man said "I am not able to dig the hole." But the stranger said "You got to keep trying and trying." The man said "I just can't do it."

E. Text Erroneous

The protocol units involve the use of text information which the reader has processed incorrectly either at the time of comprehending or at production of the recall.

E1. Errors in dates and proper names

These errors constitute memory errors or are due to lack of attention to the text. The appropriate slot is there but is inaccurately filled.

Text: Sir Wilfred Laurier

Protocol: Sir Wilfred Bennett

Text: 1864

Protocol: 1872

E2. Erroneous expansions/additions

These units (i) separate attribute/argument phrases into units that are conceptually wrong, (ii) expand a unit of information in an erroneous way (D2), or add information that is incorrect in terms of world knowledge of the events mentioned, or is contradictory with information in the text. These may be due to lack of experience with the content and/or the ambiguity of the text.

Text: They ground corn.

Protocol: They ground corn by heating it.

Text: The lobster's claws.

Protocol: The lobster claws.

E3. Inaccurate/incorrect synthesis

Information from different units of the text is (i) designated by an inaccurate superordinate referent, or (ii) is generalized in a way which does not convey the gist of the passage.

Text: We shouldn't always knock computers when they seem to make an error on our accounts. Granted we might be upset when our balance is nil and the computer still insists that we send a check for $40.00. However, if computers were assigned to do the many menial tasks of administrative affairs and leave more time for humans to use their intelligence to solve the more significant problems, then computers and humans would be compatible and would coexist in harmony.

Protocol: Computers are frustrating.

Text: While visiting her Aunt Lizzie at the farm last weekend, Teri helped harvest some carrots, peas, zucchini, and tomatoes.

Protocol: Last weekend Teri helped her Aunt harvest some fruit.

E4. Inaccurate/incorrect summary

In combining information the reader confuses information about a particular referent.

Text: As the man was scraping snow off the ice he saw someone standing beside him. The man said to the stranger "I don't think I can finish visiting my lines because I am so cold and hungry." The stranger said he would help. He dug new holes for the man and also showed him where to get caribou.

Protocol: A stranger came along. He helped the man dig holes through the ice and then they saw a caribou herd go by.

Text: Mrs. Gray sat down to watch the TV announcer on her weekly show about gardening.

Protocol: Mrs. Gray sat down to watch the TV announcer on his weekly show about gardening.

Text: The dogs lay down and refused to move. The man dragged the sled all the way to the cabin.

Protocol: The dogs dragged the sled to the cabin.

E5. Faulty Inference

The reader draws an incorrect inference from the information given in the text.

Text: Mrs. Gray knew it was two o'clock because she could hear Henry, her parrot squawking. He wanted to watch his favorite TV program. But Mrs. Gray thought that too much TV was bad for Henry's eyes so she told him to rest instead. He squawked even louder so she finally turned on the TV set. After Henry's show was over, she stayed to watch a show on cooking.

Protocol: Mrs. Gray came in from the garden to watch her TV show.

Stage 4: Weighting

The matter of assigning a weight in points to the unit chosen is an arbitrary decision and should be determined by the purpose of the analysis.

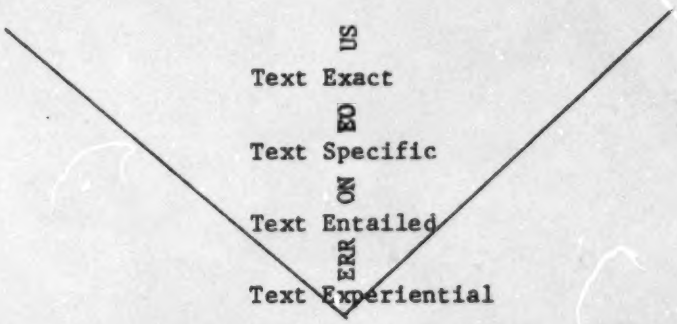
It is suggested that the weighting be assigned on the basis of the number of categories evident in the reader's recall as opposed to the number of units recalled. That is, one unit may be assigned to two categories. The rationalization for this is that the analysis is hopefully indicative of what the reader was doing when reading. Consequently if one unit (clause) indicates that the reader used a Pronoun Substitution (B1) and Case related Information (D2), then this should be so noted.

An incomplete t-unit is sometimes not a clause (lacks a finite subject or verb) but is considered equivalent to a clause unit for scoring purposes.

Validity and Reliability

The comprehension categories have been based on the construct of reading comprehension (as measured by a recall) as involving the reception and production of information which is generated from an interaction of the text data and the reader's prior knowledge. As indicated in the description of the categories, certain assumptions about the underlying processes that may contribute to that category are made based on the work of Kintsch and VanDijk (1978).

The categories may be sequenced in terms of the proportion of text data and prior knowledge that may have contributed to the recall. This sequence may be illustrated by the following diagram with the amount of text decreasing from text exact to text experiential.



In order to obtain adequate reliability, the following guidelines are suggested:

1. Each scorer be thoroughly familiar with the categories, their definitions, and examples.

2. A number of protocols be scored as points for discussion before the independent scoring is done. At this point, definitions or examples may need to be further clarified.

3. If a unit is not readily assigned to a category, then the scorer should engage in the process of category elimination.

4. Posing a question on the unit being analysed may help clarify the category which represents what the reader was doing. For example, if the unit supposedly indicates Text Verbatim, then an appropriate question for the reader is "Tell me if this was present in what you just read." If the unit is suspected as being Case Related Information, then a question might be "Is this true about grinding corn? Do they pound it with a stone?" For an inference the question posed might be "What information in the story suggests this statement (the inference)?" For a synthesis, the question "Can you elaborate on this?" might be considered. The scorer will have to judge whether or

not the reader could respond to such questions. If so, then it is plausible that this unit belongs within the category indicated.

Using the above guidelines, five recall protocols comprising 187 clauses were assigned to categories. The interrater reliability in terms of percentage agreement were:

Category A	98.5
B	97
C	93
D	96
E	95

Concluding Statement

In order to assess comprehension, one must consider both the process (reception and production) and the product. It is difficult to get at the former which must be inferred. The comprehension categories provided in this article hopefully will allow both factors to be taken into account.

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